

VITA

Harry L. Snyder

Personal

SGFOIA3

Date of Birth:

Marital Status:

Education

A. B.: Brown University, 1958  
M. A.: The Johns Hopkins University, 1960  
Ph.D.: The Johns Hopkins University, 1961

Teaching Experience

1957-58 Undergraduate instructor, Brown University  
1958-60 Graduate instructor, The Johns Hopkins University  
1960-61 Instructor, Peabody Institute, Baltimore, Maryland  
1961-62 Instructor, Colgate University  
1963-64 Lecturer, Claremont Graduate School  
1964-65 Lecturer, California State College at Long Beach  
1969-70 Lecturer, University of Southern California Institute of  
Aerospace Operations Management  
1970-72 Associate Professor, Department of Industrial Engineering and  
Operations Research, Virginia Polytechnic Institute and State  
University, Blacksburg, Virginia  
1972- Professor and Director, Human Factors Laboratory, Department of  
Industrial Engineering and Operations Research, Virginia Polytechnic  
Institute and State University, Blacksburg, Virginia  
1975- Head, Department of Industrial Engineering and Operations Research,  
Virginia Polytechnic Institute and State University, Blacksburg,  
Virginia

1961 : Research Psychologist, U. S. Army Aberdeen Proving Ground, Maryland

Responsible for design, conduct and analysis of research study to evaluate two-axis gun turret tracking.

1962-65: Senior Research Engineer, Human Factors Department, Autonetics, Anaheim, California

Principal Investigator on ONR-sponsored research on visual displays.

Principal Investigator on USAF-sponsored contract to evaluate multi-sensor target recognition.

Responsible scientist on company-funded human factors laboratory and flight test research on multi-sensor target recognition, manual control (tracking), and novel display technique design and evaluation.

1965-67: Group Scientist, Human Factors Experimental Programs, Autonetics, Anaheim, California

Responsible line supervisor of research activities of twelve professional experimental psychologists plus supporting personnel staff of human factors laboratory. Assignment included design, development, and operation of 5800 square-foot Human Factors Research Laboratory for the study of various avionic-related functions. Research efforts included air-to-ground target recognition, multi-sensor imagery interpretation, real-time and near-real-time imagery interpretation, time-constrained information processing, evaluation of new display techniques, and continuous manual control (tracking).

Program Manager and responsible scientist on USAF-sponsored 22-month simulation evaluation of airborne low-light-level television systems. This four-phase program obtained laboratory data, using both fixed-base and moving-base simulation techniques, on the effects of numerous LLLTV system parameters on observer performance.

1967-69: Chief, Sensor Display Laboratory, The Boeing Company, Seattle, Washington

Responsible for designing and conducting research studies to evaluate airborne crew performance as it is determined by numerous design parameters of airborne imaging sensors, displays, controls, data processors, and task loading.

1969-70: Manager, Attack Subsystem, The Boeing Company, Seattle, Washington

Program Manager of a long-range research and development program to design optimum military avionics for attack aircraft. Program elements include crew performance studies, systems analysis, mathematical model development, and hardware design.

1970-77: Associate Professor and Professor, Virginia Polytechnic Institute and State University, Blacksburg, Virginia

Developing human factors teaching and research laboratory, and conducting research on (1) image quality of visual display systems, (2) transportation system analysis and training, (3) visual search, and (4) visual evoked cortical potentials.

#### Consulting Experience

1964-67: Consultant to Rancho Los Amigos Hospital, Downey, California, clinical research department on problems of research design and statistical analysis.

1965-67: Consultant to Joint Chiefs of Staff, Joint Task Force Two on problems of field test design, simulation technique, statistical analysis, and simulation tests.

1970-77: Consultant to Institute for Defense Analyses on human factors and display/control problems, particularly those of imaging systems.

1971-73: Consultant to Martin-Marietta Corporation on display/control system design.

1972 : Consultant to N.Y.C. Subway System on decision making, equipment design, command/control, and training problems.

1973 : Consultant to Westinghouse Electric Corporation on statistical design/analysis and human factors.

1974 : Consultant to Fairchild Camera Corporation on airborne display system design.

1975 : Consultant to Marlin-Rockwell Corporation on bearing inspection problems.

1976-present: Consultant to General Electric Company on design and evaluation of advanced integrated display systems.

American Psychological Association: Member (1961-present); Fellow,  
Division 21-Society of Engineering Psychologists (1974-present).

Human Factors Society: Member (1963-present); Fellow (1974-present);  
Executive Council (1976-79); Executive Committee (1976-77).

Optical Society of America: Member (1968-present); Fellow (1975-present).

The Ergonomics Society: Member (1971-present)

International Ergonomics Association: Executive Council (1976-79)

Society for Information Display: Member (1971-present)

Other Professional Activities

1972-73: Editorial Board, Human Factors

1973-76: Editor, Human Factors

1973-present: Editorial Board, Ergonomics Abstracts

1975-78: Program Committee (Chairman, 1977-78), Society of Engineering  
Psychologists

1976-present: Associate Editor, Human Factors

1976-present: Editorial Board, Applied Ergonomics

1976-77: Program Committee, Society for Information Display

1972-present: Proposal reviewer for National Science Foundation,  
National Institutes of Health, and Army Research Office-  
Durham.

Hulse, S. H., Snyder, H. L., and Bacon, W. E. Instrumental licking behavior as a function of schedule, volume, and concentration of a saccharine reinforcer. Journal of Experimental Psychology, 1960, 60, 359-364.

Snyder, H. L. and Hulse, S. H. Effect of volume of reinforcement and number of consummatory responses on licking and running behavior. Journal of Experimental Psychology, 1961, 61, 474-479.

Bacon, W. E., Snyder, H. L., and Hulse, S. H. Saccharine preference in satiated and deprived rats. Journal of Comparative and Physiological Psychology, 1962, 55, 112-114.

Snyder, H. L. Saccharine concentration and deprivation as determinants of instrumental and consummatory response strengths. Journal of Experimental Psychology, 1962, 63, 610-615.

Kinkade, R. G., Snyder, H. L., and Greening, C. P. Simulation of a star field. Human Factors, 1963, 5, 335-338.

Rusis, G., and Snyder, H. L. The effects of TV camera field of view and size of targets upon air-to-ground target recognition. Human Factors, 1965, 7, 493-501.

Snyder, H. L. Image quality and face recognition on a television display. Human Factors, 1974, 16, 300-307.

Snyder, H. L. On the definition of television system image quality. Ergonomics, 1974, 17, 566.

Snyder, H. L. Crosscultural human factors. Review of Ethnic variables in human factors engineering, Edited by A. Chapanis. Human Factors Society Bulletin, June 1975, 7-8.

Snyder, H. L. Braking movement time and accelerator-brake separation. Human Factors, 1976, 18, 201-204.

#### Books/Book Chapters

Kinkade, R. G., Snyder, H. L., and Greening, C. P. Simulation of a star field. In Visual Capabilities in the Space Environment, C. A. Baker (Ed.), Pergamon Press, London, 1965.

Snyder, H. L. Image quality and operator performance. Chapter two in Biberman, L. M. (Ed.) Perception of Displayed Information, Plenum Press, 1973.

- Snyder, H. L., Oatman, L. C., and Wallach, H. C. An investigation comparing the relative effects of two modes of gun turret operation on tracking performance: Study II. HEL TM.5-62, Aberdeen Proving Ground, 1962.
- Snyder, H. L., Visual aspects of low-level flight. In J. W. Miller (Ed.), Visual and Display Problems Related to Flight at Low Altitude, Office of Naval Research, Washington, 1964.
- Greening, C. P., Sweeney, J. S., and Snyder, H. L. A device for remote monitoring of helmet position. In Proceedings of the Fifth National Symposium on Human Factors in Electronics; IEEE, New York, 1964.
- Snyder, H. L., Greening, C. P., and Calhoun, R. L. An experimental comparison of TV and direct vision for low altitude target recognition. Autonetics Report T-46/3111-4, 1964.
- Snyder, H. L. and Greening, C. P. Visual performance in simulated low-altitude flight. Autonetics Report EM 1163-123, 1963.
- Snyder, H. L. and Calhoun, R. L. Laboratory studies in air-to-ground target recognition: I. Program description and initial visual recognition data. Autonetics Report T5-131/3111, April 1965.
- Rusis, G., Snyder, H. L., and Greening, C. P. Laboratory studies in air-to-ground target recognition: IV. The effect of TV display freeze. Autonetics Report T5-738/3111, May 1965.
- Calhoun, R. L. and Snyder, H. L. Laboratory studies in air-to-ground target recognition: V. Effects of aircraft speed and target type. Autonetics Report T5-990/3111, May 1965.
- Calhoun, R. L. and Snyder, H. L. Laboratory studies in air-to-ground target recognition: VI. A comparison of IR and direct vision. Autonetics Report T5-740/3111, October 1965.
- Rusis, G., Snyder, H. L., Greening, C. P., and Rawlings, S. C. Laboratory studies in air-to-ground target recognition: VII. Further research on the effect of TV display freeze. Autonetics Report T5-1463/3111, October 1965.
- Snyder, H. L., Earl, W. K., Wyman, M. J., and Sturm, R. D. A simulation study of multi-sensor target recognition. Air Force Technical Report SEG-TR-65-74, November 1965.
- Snyder, H. L. and Wyman, M. J. Detailed simulation test plan to supplement Joint Task Force Two Test 4.1. Autonetics Report C6-650/3111, March 1966.

Snyder, H. L., Wyman, M. J., and Sturm, R. D. Functional performance requirements for a fixed-base air-to-ground simulator. Autonetics Report C6-782/3111, April 1966.

Sturm, R. D., Snyder, H. L., Syman, M. J., and Rawlings, S. C. The effect of predesignation information upon target and checkpoint recognition performance. Autonetics Report C6-274/3111, April 1966.

Greening, C. P. and Snyder, H. L. Visual target acquisition survey. Autonetics Report C7-1479/501, June 1967.

Snyder, H. L. Low-light-level TV viewfinder simulation program; Phase A. State-of-the-art reviews and simulation plans. Report AFAL-TR-67-293, November 1967.

Wyman, M. J., Snyder, H. L., Sturm, R. D., and Kuechler, M.S. Low altitude Test 4.1: Visual target acquisition. Volume 7, Simulation Studies, Extension B. Report of the Joint Chiefs of Staff, Joint Task Force Two, November 1968.

Gilmour, J. D., Snyder, H. L., Wyman, M. J., and Jahns, D. W. Low altitude test 4.1: Visual target acquisition. Volume 7, Simulation Studies, Basic validation. Report of the Joint Chiefs of Staff, Joint Task Force Two, November 1968.

Snyder, H. L. and Chi, V. L. Sensor display simulator preliminary design study. Boeing Company technical document D6-53626, 4 February 1969.

Snyder, H. L. Image quality and operator performance. Chapter two in Biberman, L. M., Schnitzler, S. D., Rosell, F. A., and Snyder, H. L. Low Light Level Devices, published by Institute for Defense Analyses, 1970.

Snyder, H. L., Keesee, R. L., Beamon, W. S. and Aschenback, J. R. Visual search and image quality. USAF Technical Report AMRL-TR-73-114, 1974.

Beamon, W. S. and Snyder, H. L. An experimental evaluation of the spot wobble method of suppressing raster structure visibility. USAF Technical Report AMRL-TR-75-63, 1975.

Snyder, H. L. and Taylor, D. F. Computerized analysis of eye movements during static display visual search. USAF Technical Report AMRL-TR-75-91, 1976.

Snyder, H. L. Visual search and image quality: Final report. USAF Technical Report AMRL-TR-76-89, 1977.

- Snyder, H. L. and Sweeney, J. S. Simulated visual and radar tracking of ground objects from low altitude, high speed aircraft. Presented before the Professional and Technical Group on Human Factors in Electronics, IEEE, May, 1963, Washington, D. C.
- Snyder, H. L. Air-to-ground visual target recognition. Presented before 72nd Annual Convention of the American Psychological Association, Los Angeles, 1964.
- Snyder, H. L. High speed target acquisition. Paper presented before 14th Military Operations Research Symposium, San Diego, 1964.
- Snyder, H. L. and Greening, C. P. The effects of direction and velocity of relative motion upon dynamic visual acuity. Presented before 37th Annual Meeting of Aerospace Medical Association, Las Vegas, 20 April 1966.
- Snyder, H. L., Ungar, M. D., and Sweeney, J. S. A comparison of joystick and helmet-mounted control systems for pursuit tracking. Presented before the Third National Symposium of the Society for Information Display, 26 February 1964.
- Snyder, H. L. The use of sensors in target acquisition. Presented before the 15th Military Operations Research Symposium, Norfolk, Virginia, 29 April 1965.
- Snyder, H. L. Laboratory simulation of TV, IR, and radar. Presented before the 16th Military Operations Research Symposium, Seattle, Washington, 25 October 1965.
- Gilmour, J. D. and Snyder, H. L. Visual target acquisition simulation results. Presented before the 22nd Military Operations Research Symposium, Monterey, California, October 1968.
- Snyder, H. L. Target acquisition and tracking. Invited address to Royal Institute of Technology, Stockholm, Sweden, August 14, 1969.
- Snyder, H. L. Sensor design requirements. Invited address to the NATO Symposium on Image Evaluation, Munich, Germany, 18-22 August 1969.
- Snyder, H. L. Dynamic visual search patterns. Invited paper presented to National Academy of Science/National Research Council Committee on Vision, May 22, 1970. Published in Visual Search, NAS, 1973.
- Snyder, H. L. Modulation transfer function area (MTFA) as a measure of image quality. Invited paper presented to National Academy of Sciences/National Research Council, May 22, 1970. Published in Visual Search, NAS, 1973.



Snyder, H. L. Detection and identification performance in air-to-ground visual search. Invited address to the Optical Society of America, Hollywood, Florida, October 2, 1970.

Snyder, H. L. On the determination of pictorial image quality. Invited address to the Virginia Academy of Science, May 14, 1971.

Snyder, H. L. Video image quality and facial recognition. Invited tutorial paper presented to the Society of Photo-Optical Instrumentation Engineers Symposium on Solving Problems in Security, Surveillance and Law Enforcement with Optical Instrumentation, New York, September 20-21, 1972. Also published in S.P.I.E. Proceedings of that symposium.

Snyder, H. L. The quality of television images. Paper presented to the 16th Annual Meeting of the Human Factors Society, Los Angeles, October 17-19, 1972.

Snyder, H. L. A unitary measure of video system image quality. Invited paper presented to Target Acquisition Symposium, Office of Naval Research, Orlando, Florida, November 14-16, 1972. Also published in ONR Proceedings of that symposium.

Snyder, H. L. A unitary measure of video system image quality. Invited paper presented to Society for Information Display International Symposium, New York, May 15-17, 1973.

Snyder, H. L. Urban Transportation. Paper presented to Society of Engineering Psychologists, Division 21 of American Psychological Association, New Orleans, August 30, 1974.

Snyder, H. L. Television image quality. Invited address to NEREM (IEEE Northeast Electronics Research and Engineering Meeting), Boston, October 31, 1974.

Snyder, H. L. Measurements of display parameters and operator performance. Invited address to Optical Society of America, Spring Conference, Anaheim, CA., March 20, 1975.

Snyder, H. L. Contemporary human factors of visual display systems. Invited tutorial to Society for Information Display International Symposium, Washington, D. C. April 25, 1975.

Snyder, H. L. On the definition of television system image quality. Paper presented to Ergonomics Research Society, Cambridge, England, April 5, 1974.

Keesee, R. L. and Snyder, H. L. Prediction of modulation detectability thresholds for line-scan displays. Paper presented at 1976 SID International Symposium, Beverly Hills, CA, May 6, 1976.

Snyder, H. L. Display image quality and the eye of the beholder. Invited paper at SPSE International Conference on Image Analysis and Evaluation, Toronto, Canada, July 21, 1976.

Papers Presented at Regional and Local Meetings

Snyder, H. L., Human Factors in Manufacturing. Paper presented to  
Charlottesville, Virginia, Chapter of AIIE, November 5, 1970.

Snyder, H. L., On the Determination of Pictorial Image Quality.  
Invited address to the Virginia Academy of Science, May 14, 1971.

Snyder, H. L., Visual Performance in Decision Making and Image Quality.  
Lectures presented to U.S. Air Force Avionics Laboratory, Dayton,  
Ohio, November 28 and 29, 1972.

Snyder, H. L. Human Factors in Manufacturing. Presentation to Shenandoah  
Valley Chapter of AIIE, January 24, 1973.

Snyder, H. L. Human Factors in Manufacturing. Presentation to Raleigh, N.C.  
Chapter of AIIE, March 13, 1974.

Snyder, H. L. Human Factors in Manufacturing Productivity. Presentation  
at 24th Annual Engineering Conference, Winston-Salem, N.C. AIIE  
Chapter, March 20, 1974.

Snyder, H. L. Human Factors. Lectures presented at George Washington  
University Short Course on Electronic Display, October 1975, March  
1976, October 1976.

Snyder, H. L. Image Quality Measurements. Lectures presented at George  
Washington University Short Course in Electronic Display, October  
1975, March 1976, October 1976.

Awards and Honors

1961-Elected Member, Sigma Xi, National Scientific Research Society

1965-Nominated by National Academy of Sciences as one of original 16 Scientist-  
Astronauts

1974-Elected Fellow, Society of Engineering Psychologists

1974-Elected Fellow, Human Factors Society

1975-Elected Fellow, Optical Society of America

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Walter W. Wierwille

Personal

SGFOIA3

Date of Birth:

Marital Status:

Education

B.S.E.E.: (Honors) University of Illinois, Urbana, Illinois, June 1958

Ph.D.: Cornell University, Ithaca, New York, September 1961

Major: Automatic Control

Minors: Electronics, Applied Mathematics

Registration

REGISTERED PROFESSIONAL ENGINEER in the State of Virginia, Cert. Number 6244

Teaching Experience

1971-73: Associate Professor, Joint appointment in Department of Industrial Engineering and Operations Research and in Department of Electrical Engineering, Virginia Polytechnic Institute and State University, Blacksburg, Virginia

1973-75: Professor, Joint appointment in Department of Industrial Engineering and Operations Research and in Department of Electrical Engineering, Virginia Polytechnic Institute and State University, Blacksburg, Virginia

1975-Present Professor, Department of Industrial Engineering and Operations Research, Virginia Polytechnic Institute and State University, Blacksburg, Virginia

Research Experience

1958-59: Design Engineer, Cincinnati Milling Machine Co. (Now Cincinnati Milacron)

Responsible for research and design of a system to remove discontinuities between interpolated spans in numerically controlled machine tools.

1960: Research Assistant, Cornell Radioastronomy Laboratory, Ithaca, New York.

Developed troposcater receiver techniques.

1960-61: Research Assistant, Cornell University Computing Center, Ithaca, New York

In charge of development and application of the University analog computing system.

1961-63: Associate Research Engineer, Cornell Aeronautical Laboratory, Buffalo, New York.

1963-65: Research Engineer, Cornell Aeronautical Laboratory, Buffalo, New York.

1965-67: Principal Research Engineer, Cornell Aeronautical Laboratory, Buffalo, New York.

1967-69: Head, Dynamic Systems Section, Avionics Department, Cornell Aeronautical Laboratory, Buffalo, New York.

Principal investigator of six projects; consultant and coinvestigator on many others. Supervisor for three to five researchers and engineers (1965-1969).

1969-70: Supervisory Scientist, ECM Systems Group, Sanders Associates, Inc., Nashua, New Hampshire.

Technical consultant to group of 25 scientists and engineers, performing design, testing, and evaluation of ECM equipment for U.S. Navy and U.S. Air Force Tactical Aircraft.

1970-71: Manager, ECM Systems Group, Sanders Associates, Inc., Nashua, New Hampshire.

Responsible for group of 25 scientists and engineers performing design, testing, and evaluation of ECM equipment for U.S. Navy and U.S. Air Force Tactical Aircraft. Development of ECM techniques used in Navy's first-line fighter aircraft (F-4, F-14).

1971-77: Associate Professor and Professor, Virginia Polytechnic Institute and State University, Blacksburg, Virginia.

Responsible for development and research applications of the University's Driving Simulator Laboratory, sponsored by the General Motors Corporation. (Project is in its fifth year). Development of manual control systems equipment. Research on workspace design procedures. Research on transportation systems, sponsored by New York City Transit Authority. Associated with the Human Factors Laboratory.

Consulting Experience

- 1971-72: Consultant to New York City Transit Authority, on redesign of the desk-trainmaster's communications interface console.
- 1973: Consultant to Babcock and Wilcox Company, Lynchburg, Virginia, on redesign of nuclear reactor failed-fuel detection systems.
- 1974-75: Consultant to National Driving Center, Duke University, Durham, North Carolina, on digital simulation of automobile dynamics and on driving simulator display design.
- 1974-present: Consultant to the Research Laboratories, General Motors Corporation, Warren, Michigan, on problems of vehicle handling, simulation of driving, and conduct of experiments in driver/vehicle systems. (This work is in addition to the research grants awarded to the University by GM.)

Professional Organizations and Offices

- Institute of Electrical and Electronics Engineers - Member since 1960, Senior member since 1972; Reviewer, IEEE Transactions on Computers, IEEE Transactions on Systems, Man, and Cybernetics, 1965-73; Member, Administrative Committee, IEEE Group on Man-Machine Systems, 1966-69.
- Human Factors Society - Member since 1965; Chairman, Technical Interest Group on Human Operator Dynamics 1972-73; Consulting Editor, Human Factors, 1972-75; Associate Editor, Human Factors, 1975-present.
- Computers in Education Division, American Society of Engineering Education - Member since 1973.
- Virginia Academy of Science - Member since 1974.
- American Institute of Industrial Engineers - Senior Member -1977.

Other Professional Activities

- Jan. 1968: Guest lecturer at Cornell University.
- Mar. 1968: Guest lecturer at Ohio State University.
- Mar. 1970: Presentation made to Assistant Secretary of the Navy for Research and Development.
- 1970-71: Developed ECM Techniques used in U.S. Navy's first line tactical aircraft.
- 1970-71: In charge of Radar Simulator Laboratory at Sanders Associates, Inc.
- 1975: Guest lecturer at Engineering Mechanics Department, General Motors Research Laboratories, 1975.

- Wierwille, W. W. Experimental determination of the frequency response of a linear transfer function for arbitrary transient inputs of finite duration. Transactions A.I.E.E., Part II, pp. 183-189, September 1961.
- Wierwille, W. W. Delay of time functions by means of frequency domain sampling. Transactions A.I.E.E., Part I, pp. 63-65, March, 1962.
- Wierwille, W. W. A new method for obtaining continuous delays on the analog computer. I.E.E.E. Transactions on Automatic Control, Vol. AC-8, pp. 73-74, January, 1963.
- Wierwille, W. W. A new approach to the spectrum analysis of nonstationary signals. I.E.E.E. Transactions on Applications and Industry, No. 96, pp. 322-327, November, 1963.
- Wierwille, W. W. A diagrammatic classification of man-machine system displays. Human Factors, Vol. 6, pp. 201-207, April, 1964.
- Wierwille, W. W. and Heckman, D. W. Synthesis of fixed-form nonlinear filters. I.S.A. Transactions, Vol. 3, pp. 210-216, July, 1964.
- Wierwille, W. W. Improvement on the human operator's tracking performance by means of optimum filtering and prediction. I.E.E.E. Transactions on Human Factors in Electronics, Vol. HFE-5, pp. 20-24, August, 1964.
- Wierwille, W. W. Experimental study of a new method of time delay for analog computers. I.E.E.E. Transactions on Electronic Computers, Vol. EC-14, pp. 617-623, August, 1965.
- Wierwille, W.W. A theory for optimal deterministic characterization of time-varying human operator dynamics. I.E.E.E. Transactions on Human Factors in Electronics, Vol. HFE-6, pp. 53-61, September, 1965.
- Wierwille, W. W. A theory and method for correlation analysis of non-stationary signals. I.E.E.E. Transactions on Electronic Computers, Vol. EC-14, pp. 909-919, December, 1965.
- Wierwille, W. W. and Gagne, G. A. Nonlinear and time-varying dynamical models of human operators in manual control systems. Human Factors, Vol. 8, pp. 97-120, April, 1966. (Errata: Vol. 9, p. 510, October, 1967).
- Wierwille, W. W. Author's reply (to comments on 'experimental study of a new method of time delay for analog computers') I.E.E.E. Transactions on Electronic Computers, Vol. EC-15, pp. 668-669, August, 1966.
- Wierwille, W. W. Nonstationary correlation analysis. Research Trends (Technical Quarterly of Cornell Aeronautical Laboratory), Vol. XV, pp. 3-9, Spring-Summer, 1967.
- Wierwille, W. W., Gagne, G. A. and Knight, J. R. A laboratory display system suitable for man-machine research. I.E.E.E. Transactions on Human Factors in Electronics, Vol. HFE-8, pp. 250-253, September, 1967.

Wierwille, W. W., Gagne, G. A. and Knight, J. R. An experimental study of human operator models and closed-loop analysis methods for high-speed automobile driving. I.E.E.E. Transactions on Human Factors in Electronics, Vol. HFE-8, pp. 187-201, September, 1967.

Wierwille, W. W. and Knight, J. R. Off-line correlation analysis of non-stationary signals. I.E.E.E. Transactions on Computers, Vol. C-17, pp. 525-536, June, 1968.

Eyster, J. W., White, J. A., Wierwille, W. W. On solving multifacility location problems using a hyperboloid approximation. A.I.I.E. Transactions, Vol. 5, pp. 1-6, March, 1973.

Wierwille, W. W. A part-task driving simulator for teaching and research. Transactions, Computers in Education Division of ASEE, Vol. 5, pp. 193-203, December, 1973.

McLane, R. G. and Wierwille, W. W. The influence of motion and audio cues on driver performance in an automobile simulator. Human Factors, Vol. 17, pp. 488-501, October, 1975.

Wierwille, W. W. Driving simulator design for realistic handling. Proceedings, Third International Conference on Vehicle System Dynamics, Sachs, H. K., Ed., Swets and Zeitlinger, Amsterdam, pp. 186-199, 1975.

Wierwille, W. W. and Fung, P. P. Comparison of computer generated and simulated motion picture displays in a driving simulation. Human Factors, Vol. 17, pp. 577-590, December, 1975.

Wierwille, W. W. Demonstrating reliability concepts using the analog computer. Transactions, Computers in Education Division of ASEE, Vol. 7, pp. 137-141, November, 1975.

Seeberger, J. J. and Wierwille, W. W. Estimating the amount of eye movement data required for panel design and instrument placement. Human Factors, Vol. 18, pp. 281-292, June, 1976.

Repa, B. S. and Wierwille, W. W. Driver performance in controlling a driving simulator with varying vehicle response characteristics. Society of Automotive Engineers paper 760779, October, 1976.

Wierwille, W. W., Gutmann, J. C., Hicks, T. G., and Muto, W. H. Secondary task measurement of workload as a function of simulated vehicle dynamics and driving conditions. Accepted for publication, Human Factors, Vol. 19, 1977.

Wierwille, W. W. and Gutmann, J. C. Comparison of primary and secondary task measures as a function of simulated vehicle dynamics and driving conditions. Accepted for publication, Human Factors, Vol. 19, 1977.



- Swonger, C. W. and Wierwille, W. W. The effects of varying radar data rate on NTDS interception capability. Cornell Aeronautical Laboratory Report No. IH-1250-P-6, May, 1962.
- Wierwille, W. W. and Schultz, W. C. Aspects of optimum nonlinear filtering using nonlinear zero-memory elements. Cornell Aeronautical Laboratory Report No. ID-1442-P-2, Project CONFORM, January, 1962.
- Wierwille, W. W. and Pelton, F. M. Altimeter control using terrain prediction techniques. Studies and Simulation of Terrain Avoidance Problems, ASD-TDR-63-612, Vol. 1, July, 1963.
- Bordner, G. W., Greaves, C. J. and Wierwille, W. W. Research studies of random process theory and physical applications. Cornell Aeronautical Laboratory Report No. XM-1970-B-1, Contract No. NAS8-11346, June 1965. (Also published as NASA Report No. CR-61081, Marshall Space Flight Center, Huntsville, Alabama, August, 1965).
- Wierwille, W. W. and Gagne, G. A. A theory for the optimal deterministic characterization of the time-varying dynamics of the human operator. NASA Report No. CR-170, Washington, D. C., February, 1965.
- Rynaski, E. G., Whitbeck, R. F., and Wierwille, W. W. Optimal control of a flexible launch vehicle. Cornell Aeronautical Laboratory Report No. IH-2089-F-1, Contract No. NAS8-20067, February, 1966.
- Gagne, G. A. and Wierwille, W. W. Characterization of time-varying human operator dynamics. Cornell Aeronautical Laboratory Report No. UA-2068-B-1, Contract No. NAS1-4920, November, 1965. (Also published as NASA Report No. CR-539, Washington, D. C., August, 1966).
- Wierwille, W. W. and Knight, J. R. Study of nonstationary random process theory. Cornell Aeronautical Laboratory Report No. XM-1970-B-3, Contract NAS8-11346, June, 1967.
- Wierwille, W. W. Dynamic modeling of the driver. Proceedings of the Conference on Mathematical Models and Simulation of Automobile Driving, pp. 134-143, September, 1967. (Available through U.S. Public Health Service, Injury Prevention Section, National Center for Urban and Industrial Health, Cincinnati, Ohio).
- Wierwille, W. W. and Knight, J. R. Synthesis of manual aerospace control systems with applications to SST design. Cornell Aeronautical Laboratory Report No. IM-2429-B-1, Contract No. NAS1-7141, March 1968. (Also published as NASA Report No. CR-1208, Washington, D. C., December, 1968).
- Leonard, J. J. and Wierwille, W. W. Human performance validation of simulators: theory and experimental verification. Proceedings, 19th Annual Meeting of the Human Factors Society, Dallas, pp. 446-456, October, 1975.
- Repa, B. S. and Wierwille, W. W. Driver performance in controlling a driving simulator with varying vehicle response characteristics. GM Research Laboratories Report GMR-2205, July, 1976.

Repa, B. S., Wierwille, W. W. and Zucker, R. S. The application of integral performance criteria to the analysis of discrete maneuvers in a driving simulator. GM Research Laboratories Report (to appear).

Papers Presented at National and International Meetings

- Wierwille, W. W. Experimental determination of the frequency response of a linear transfer function for arbitrary transient inputs of finite duration. Paper No. 61-745-II; Presented at the AIEE Summer General Meeting, Ithaca, New York, June, 1961.
- Wierwille, W. W. Frequency analysis of adaptive control systems. Paper No. 1935-61. Presented at the American Rocket Society Guidance, Control, and Navigation Conference, Stanford University, Stanford, Calif., August, 1961.
- Wierwille, W. W. Delay of time functions by means of frequency domain sampling. Paper No. 62-21-I. Presented at the AIEE Winter General Meeting, New York, New York, January, 1962.
- Wierwille, W. W. A new approach to the spectrum analysis of nonstationary signals. Paper No. 63-63-II. Presented at the IEEE Winter General Meeting, New York, New York, January, 1963.
- Wierwille, W. W. and Shultz, W. C. Nonlinear zero-memory filtering: review and some new results. Presented at the IEEE Summer General Meeting, Toronto, Canada, June, 1963.
- Wierwille, W. W. and Gagne, G. A. Experimental study of a deterministic method for time-varying characterization of human operator dynamics. Presented at the Sixth Annual Symposium of the IEEE Professional Group on Human Factors in Electronics, Boston, Mass., May, 1965.
- Wierwille, W. W. A theory for optimal deterministic characterization of time-varying human operator dynamics. Presented at the IEEE 1965 International Convention; appeared in Convention Record, Vol. 13, Part 6, pp. 128-142, March, 1965.
- Eyster, J. W., White, J. A., and Wierwille, W. W. On solving multifacility location problems using a hyperboloid approximation procedure. Presented at the Joint ORSA/TIMS/AIIE National Meeting, Atlantic City, New Jersey, November, 1972.
- Wierwille, W. W. Driving simulator design for realistic handling. Presented at the Third International Conference on Vehicle System Dynamics, August 12-14, 1974, Blacksburg, Virginia.
- Repa, B. S. and Wierwille, W. W. Driver performance in controlling a driving simulator with varying vehicle response characteristics. Presented at the S.A.E. National Automobile Engineering Meeting, Dearborn, Michigan, October, 1976.

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Awards and Honors

- 1954-58 - Evans Scholarship, University of Illinois
- 1956 - Member, Tau Beta Pi
- 1956 - Member, Eta Kappa Nu
- 1956 - Member, Sigma Tau
- 1958-59 - IBM - Cornell University Fellowship
- 1959 - Associate Member, Sigma Xi
- 1959-60 - Republic Aviation Corp. - Cornell University Fellowship
- 1961 - Cornell University Scholarship
- 1963 - Member, Sigma Xi
- 1967 - Chosen by National Academy of Sciences as scientifically qualified to become a Scientist-Astronaut.
- 1969 - Cited in Dictionary of International Biography for Original Research Contributions.
- 1973 - Listed in Who's Who in Virginia

Robert C. Williges

Personal

SGFOIA3

Date of Birth:

Marital Status:

Education

A.B.: Wittenberg University, 1964

M.A.: The Ohio State University, 1966

Ph.D.: The Ohio State University, 1968

Teaching Experience

1968-72: Assistant Professor of Psychology and Assistant Professor of Aviation, University of Illinois at Urbana-Champaign

1972-76: Associate Professor of Psychology and Associate Professor of Aviation, University of Illinois at Urbana - Champaign

1976-present: Professor of Industrial Engineering and Operations Research and Professor of Psychology, Virginia Polytechnic Institute and State University

Research Experience

1964-68: Research Assistant, Human Performance Center, The Ohio State University, Columbus, Ohio.

Duties: Participated in the design of research, supervision of experimental assistants during conduct of research, analysis of data, and preparation of written reports on human factors research dealing with team training and visual monitoring of complex, computer-generated displays.

1968-70: Assistant Director, Highway Traffic Safety Center, University of Illinois, Urbana, Illinois.

Duties: Administrative responsibilities for monitoring entire research effort at the Highway Traffic Safety Center. Supervisory responsibility for contract negotiations, review of technical proposals and reports, and principal investigator on decision making and driver training research.

1970-72: Assistant Head, Aviation Research Laboratory, University of Illinois, Savoy, Illinois.

Duties: Administrative responsibility for proposal development, supervision of research activities, management of contract responsibilities, and both written and oral briefings on research findings dealing with aviation research. Served as principal scientist on major research projects dealing with response surface methodology applications to transfer of training and target acquisition performance; investigation of rate-field displays, and applications of frequency - separation principles to aircraft displays.

1972-76: Associate Head, Aviation Research Laboratory, University of Illinois, Savoy, Illinois.

Duties: General responsibility for supervising entire research program at the Aviation Research Laboratory including direct management of proposal development; contract responsibilities of managing research funding expenditures; and general supervisors of laboratory, simulations, and inflight research activities. Served as principal scientist on projects dealing with adaptive training procedures, predictor display principles, and integrated, computer-generated aircraft displays.

1976-present: Professor, Human Factors Laboratory, Virginia Polytechnic Institute and State University.

Duties: Management of graduate students and technical staff supporting human factors research. Principal investigator of research dealing individualized, computer-adaptive motor skills training.

#### Consulting Experience

1971: Anacapa Sciences, Inc., Santa Barbara, California. Consulting on experimental design.

1974: University of Maryland, College Park, Maryland. Consulting on basic research needs for the U.S. Air Force.

1974: Northrop Corporation, Hawthorne, California. Consulting on statistical design analysis for flying training research.

1976: Bell Telephone Laboratories, Piscataway, New Jersey. Consulting on response surface methodology analysis.

Human Factors Society: Member - 1968-75.  
Fellow - 1975-present.

American Psychological Associations, Division 21: Member - 1968-76.  
Fellow - 1976-present.

Elected Professional Offices

- 1970: President-elect, Sangamon Valley Chapter of the Human Factors Society
- 1971: President, Sangamon Valley Chapter of the Human Factors Society
- 1972: Secretary-Treasurer, Division 21, American Psychological Assoc. 1972-1978
- 1974: Member of Publications Board, Human Factors Society (1974-1976)

Other Professional Activities

Professionally-related Committees:

- 1968-70: Highway Research Board Committee TO-11, Road User Characteristics
- 1970-72: Membership Committee, Division 21, American Psychological Assoc.
- 1971-72: Project Advisory Committee of an Illinois Cooperative Highway Research Program entitled, "Rural Intersection Illumination Criteria." (Appointed by the Illinois Division of Highways)
- 1972-78: Executive Council, Division 21, American Psychological Assoc.
- 1972: Chapter Affairs Committee, Human Factors Society
- 1973: Member of Task Force on USAF Basic Research Needs
- 1973-74: Chairman, Education Committee, Human Factors Society
- 1973: The International Ergonomics Association, Amsterdam, Netherlands
- 1976-77: Training and Education Committee, Division 21, American Psychological Association.

Editorial Duties:

1968-69: Reviewed human factors papers for the Highway Research Board of the National Academy of Sciences.

Occassional reviewer for:

American Journal of Psychology  
Journal of Experimental Psychology  
McGraw-Hill Publishers  
John Wiley & Sons, Inc. Publishers

1971-73: Member of Editorial Board of Human Factors

1973-75: Associate Editor, Human Factors

1975-present: Reviewer for Engineering Psychology section of Journal Supplement Abstract Service

1976-present: Editor, Human Factors



Refereed Publications in Open Literature

- Williges, R. C., Johnston, W. A., and Briggs, G. E. Role of verbal communication in teamwork. Journal of Applied Psychology, 1966, 50, 473-478.
- Williges, R. C. Within-session criterion changes compared to an ideal observer criterion in a visual monitoring task. Journal of Experimental Psychology, 1969, 81, 61-66.
- Johnston, W. A., Howell, W. C., and Williges, R. C. The components of complex monitoring. Organizational Behavior and Human Performance, 1969, 4, 112-124.
- Williges, R. C. and Streeter, H. Display characteristics in inspection tasks. Journal of Applied Psychology, 1971, 55, 123-125.
- Williges, R. C. The role of payoffs and signal ratios in criterion changes during a monitoring task. Human Factors, 1971, 13, 261-267.
- Williges, R. C., and Simon, C. W. Applying response surface methodology to problems of target acquisition. Human Factors, 1971, 13, 511-520.
- Swartzendruber, L., Ince, F., Williges, R. C., and Roscoe, S. N. An experimental investigation of two linear rate-field displays. Human Factors, 1971, 13, 569-575.
- Scanlan, L. A., Roscoe, S. N., and Williges, R. C. Time-compressed displays for target detection. Aviation Research Monographs, 1971, 1, (3), 41-66.
- Williges, R. C. and North, R. A. Knowledge of results and decision making performance in visual monitoring. Organizational Behavior and Human Performance, 1972, 8, 44-57.
- Roscoe, S. N., Williges, R. C., and Hopkins, C. O. The new aviation scientist -- psychologist and engineer. Professional Psychology, 1972, 3, 288-291.
- Williges, R. C. Manipulating the response criterion in visual monitoring. Human Factors, 1973, 15, 179-185.
- Clark, C. and Williges, R. C. Response surface methodology central-composite design modifications for human performance research. Human Factors, 1973, 15, 295-310.
- Williges, R. C. and Baron, M. L. Transfer assessment using a between-subjects central-composite design. Human Factors, 1973, 15, 311-320.
- Williges, R. C. and North, R. A. Prediction and cross-validation of video cartographic symbol location performance. Human Factors, 1973, 15, 321-326.

Mills, R. G. and Williges, R. C. Performance prediction and single-operator simulated surveillance system. Human Factors, 1973, 15, 327-348.

Williges, R. C. and Mills, R. G. Predictive validity of central-composite design regression equations. Human Factors, 1973, 15, 349-354.

Jacobs, R. S., Williges, R. C. and Roscoe, S. N. Simulator motion as a factor in flight-director display evaluation. Human Factors, 1973, 15, 569-582.

Williges, B. H., Roscoe, S. N. and Williges, R. C. Synthetic flight training revisited. Human Factors, 1973, 15, 543-560.

Ince, F. and Williges, R. C. Detecting slow changes in system dynamics. Human Factors, 1974, 16, 277-284.

Baron, M. L. and Williges, R. C. Transfer effectiveness of a driving simulator. Human Factors, 1975, 17, 71-80.

Roscoe, S. N. and Williges, R. C. Motion relationships in aircraft attitude and guidance displays: A flight experiment. Human Factors, 1975, 17, 374-387.

Ince, F., Williges, R. C., and Roscoe, S. N. Aircraft simulator motion and the order of merit of flight attitude and steering guidance displays. Human Factors, 1975, 17, 388-400.

Beringer, D. B., Williges, R. C. and Roscoe, S. N. The transition of experienced pilots to a frequency-separated aircraft attitude display. Human Factors, 1975, 17, 401-414.

Gopher, D., Williges, B. H., Williges, R. C. and Damos, D. L. Varying the type and number of adaptive variables in continuous tracking. Journal of Motor Behavior, 1975, 7, 159-170.

Moll, J. D. and Williges, R. C. Motion versus pattern cues in visually time-compressed target detection in static noise. Journal of Applied Psychology, 1976, 60.

Williges, R. C. Research note: Modified orthogonal central-composite designs. Human Factors, 1976, 18, 95-98.

Williges, R. C. The vigilance increment: An ideal observer hypothesis. In T. B. Sheridan and G. Johansson (Eds.) Monitoring behavior and supervisory control. Plenum Publishing Corp: New York, 1976, 181-192.

Swartzendruber, L., Ince, F., Williges, R. C., and Roscoe, S. N.

A preliminary test of two rate-field displays. Paper presented at the Human Factors Society annual meeting, October 1970.

Williges, R. C., and Simon, C. W. Response surface methodology related to problems of target acquisition. Paper presented at the Human Factors Society annual meeting, October 1970.

Johnson, S. L., Williges, R. C., and Roscoe, S. N. A new approach to motion relations for flight director displays. Paper presented at the Human Factors Society annual meeting, October 1971.

Baron, M. L., and Williges, R. C. Transfer of training assessment by means of response surface methodology. Paper presented at the Human Factors Society annual meeting, October 1971.

North, R. A., and Williges, R. C. Video cartographic image interpretability assessed by response surface methodology. Paper presented at the Human Factors Society annual meeting, October 1971.

Clark, C. E., and Williges, R. C. Response surface methodology design variants useful in human performance research. Paper presented at the Human Factors Society annual meeting, October 1971.

Erismann, J. G., and Williges, R. C. Agricultural safety in higher education -- engineering emphasis. Paper to be presented at the American Society of Agricultural Engineering annual meeting, December 1971.

North, R. A., and Williges, R. C. Double cross-validation of video cartographic symbol location performance. In Knowles, W. B., Sanders, M. S., and Muckler, F. A. (Eds.) Proceedings of the 16th annual meeting of the Human Factors Society. Los Angeles: Human Factors Society, October 1972, 220-230.

Williges, R. C., and Streeter, H. Influence of static and dynamic displays on inspection performance. In Knowles, W. B., Sanders, M. S., and Muckler, F. A. (Eds.) Proceedings of the 16th annual meeting of the Human Factors Society. Los Angeles: Human Factors Society, October 1972, 291-296.

Williges, R. C. and Roscoe, S. N. Simulator motion in aviation system design research. Paper presented at NATO conference on optimum balance between man and machine in man-machine systems, Utrecht, The Netherlands, May 1973.

Williges, R. C. Applications of response surface methodology to human performance. Paper presented at American Psychological Association 81st Annual Convention, August 1973.

- attitude and guidance displays: A flight experiment. In M. P. Ranc, Jr., and T. B. Malone (Eds.) Proceedings of the seventeenth annual meeting of the Human Factors Society, Santa Monica, Calif.: Human Factors Society, October 1973, 246-255.
- Ince, F., Williges, R. C., and Roscoe, S. N. Aircraft simulator motion and the order of merit of flight attitude and steering guidance displays. In M. P. Ranc, Jr., and T. B. Malone (Eds.) Proceedings of the seventeenth annual meeting of the Human Factors Society. Santa Monica, Calif.: Human Factors Society, October 1973, 356-263.
- Clark, C., Scanlan, L. A., and Williges, R. C. Mixed-factor response surface methodology central-composite design considerations. In M. P. Ranc, Jr. and T. B. Malone (Eds.) Proceedings of the seventeenth annual meeting of the Human Factors Society. Santa Monica, Calif.: Human Factors Society, October 1973, 281-288.
- Williges, R. C. Aviation scientists: An interdisciplinary graduate program. Paper presented at American Technical Education Association Region VI Seventh Annual Conference, October 1973.
- Beringer, D. B., and Williges, R. C. Evaluation of the frequency-separated display principle. Paper presented at the Fourth Annual Psychology in the Air Force Symposium, April 1974.
- Gopher, D., Williges, B. H., Williges, R. C., and Damos, D. C. Manipulating the number and type of adaptive variables in training. In E. L. Saenger and M. Kirkpatrick III (Eds.) Proceedings of the eighteenth annual meeting of the Human Factors Society. Santa Monica, Calif.: Human Factors Society, October 1974, 334-341.
- Beringer, D. B., Williges, R. C., and Roscoe, S. N. The transition of experienced pilots to a frequency-separated aircraft attitude display: A flight experiment. In E. L. Saenger and M. Kirkpatrick III (Eds.) Proceedings of the eighteenth annual meeting of the Human Factors Society. Santa Monica, Calif.: Human Factors Society, October, 1974, 62-70.
- Moll, J. D., and Williges, R. C. Pattern and motion characteristics of visually time-compressed target detection in static noise. In E. L. Saenger and M. Kirkpatrick III (Eds.) Proceedings of the eighteenth annual meeting of the Human Factors Society. Santa Monica, Calif.: Human Factors Society, October, 1974, 139-145.
- Williges, R. C., Hopkins, C. O., and Rose, D. J. Effects of aircraft simulator motion cue fidelity on pilot performance. Paper presented at the Deutsche Gesellschaft fur Ortung und Navigation meeting. Bremen, Germany, April 1975.

Williges, R. C. A tribute to George Briggs: Reflections from colleagues. Part 2 - lessons in systems research. Paper presented at the American Psychological Association, Chicago, Ill., September 1975.

Williges, B. H. and Williges, R. C. Manual versus automatic adaptive skill training. Proceedings of the 5th Symposium on Psychology in the Air Force, U. S. Air Force Academy, April 1976, 31-35.

Williges, R. C. The vigilance increment: An ideal observer hypothesis. Paper presented at NATO symposium on monitoring behavior and supervisory control, Berchtesgaden, Germany, March, 1976.

Gallagher, P. D., Hunt, R. A., and Williges, R. C. A regression approach to generate aircraft predictor information. Paper presented at the Twelfth Annual Conference on Manual Control, University of Illinois at Urbana-Champaign, May 1976.

Williges, B. H. and Williges, R. C. Critical variables in adaptive training. Paper presented at the 6th Congress of the International Ergonomics Association, College Park, Maryland, July 1976.

#### Other Publications

Williges, R. C., and Huffman, W. J. Effects of alcohol on decision-making behavior in a visual detection task. Urbana, Ill.: University of Illinois, Highway Traffic Safety Center, Research Report 4, May 1970.

Clark, C. E., Williges, R. C., and Carmer, S. G. General computer program for response surface methodology analyses. Savoy, Illinois: University of Illinois, Institute of Aviation, Aviation Research Laboratory, Technical Report ARL-71-8/AFOSR-71-1, May 1971.

Clark, C. E. and Williges, R. C. Central-composite response surface methodology design and analyses. Savoy, Illinois: University of Illinois, Institute of Aviation, Aviation Research Laboratory, Technical Report ARL-72-10/AFOSR-72-5, June 1972.

Williges, R. C. and Roscoe, S. N. Simulator motion in aviation system design research. Savoy, Illinois: University of Illinois, Institute of Aviation, Aviation Research Laboratory, Technical Report ARL-73-6/ONR-73-2/AFOSR-73-3, May 1973.

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Awards and Honors

Listed in American Men and Women of Science, 1973 Edition

Listed in Who's Who in the Midwest, Fifteenth Edition

1974 Jerome H. Ely Award for the outstanding paper published in  
Human Factors for 1973